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**Notes:**

1. Untranslatable words are replaced with asterisks (\*\*\*\*).
2. Texts in the figures are not translated and shown as it is.

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**CLAIMS**

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**[Claim(s)]**

[Claim 1] The cover by which the opening was formed in nothing and an end side in the shape of an rectangular pipe, an axial part, and the major diameter following the axial part, The hinge axis which it had the crevice which left the periphery part to the axial part and opposite side of the major diameter, and was formed in them, and the axial part was projected from the above-mentioned opening, and was accommodated in the above-mentioned cover, The circular board spring which it has waveform form in the direction of a circumference, and the projection which protruded on the perimeter was stopped by the above-mentioned periphery part, and was accommodated in the above-mentioned crevice, It is put between the board spring and the other end side of the above-mentioned cover, and \*\*\*\* with the above-mentioned board spring. And it consists of a pair of spheres which are located in the position of the circumference of the axial center of the above-mentioned hinge axis which makes 180 degrees mutually and by which rotation of the circumference of the above-mentioned axial center was regulated with the inner wall of the above-mentioned cover. The trough dented in the above-mentioned wave-like above-mentioned opening direction is hinge equipment characterized by being considered as the plate surface and the structure of \*\*\*\*(ing) while it is located in the position which makes 180 degrees mutually to the above-mentioned axial center and an above-mentioned pair of spheres carry out elastic deformation of the above-mentioned board spring with rotation of the above-mentioned hinge axis.

[Claim 2] The cover by which the opening was formed in nothing and an end side in tubed, an axial part, and the major diameter following the axial part, The hinge axis which it had the crevice which left the periphery part to the axial part and opposite side of the major diameter, and was formed in them, and the axial part was projected from the above-mentioned opening, and was accommodated in the above-mentioned cover, The circular board spring which it has waveform form in the direction of a circumference, and the projection which protruded on the

perimeter was stopped by the above-mentioned periphery part, and was accommodated in the above-mentioned crevice, Accommodation positioning is carried out at the receiving part formed in \*\*\*\* by which accommodation fixation was carried out at the other end side of the above-mentioned cover, and its \*\*\*\*. It is fixed to the position of the circumference of the axial center of the above-mentioned hinge axis which makes 180 degrees mutually, and consists of the above-mentioned board spring and a pair of spheres which \*\*\*\*. The trough dented in the above-mentioned wave-like above-mentioned opening direction is hinge equipment characterized by being considered as the plate surface and the structure of \*\*\*\*(ing) while it is located in the position which makes 180 degrees mutually to the above-mentioned axial center and an above-mentioned pair of spheres carry out elastic deformation of the above-mentioned board spring with rotation of the above-mentioned hinge axis.

[Claim 3] The cover by which the opening was formed in nothing and an end side in tubed, an axial part, and the major diameter following the axial part, The hinge axis which it had the axial part of the major diameter, and the receiving part formed in the opposite side, and the axial part was projected from the above-mentioned opening, and was accommodated in the above-mentioned cover, The board spring which accommodation fixation is carried out at the other end side of the above-mentioned cover, and has waveform form in the hand of cut of the above-mentioned hinge axis, Accommodation positioning is carried out at the above-mentioned receiving part, and it is fixed to the position of the circumference of the axial center of the above-mentioned hinge axis which makes 180 degrees mutually, and consists of the above-mentioned board spring and a pair of spheres which \*\*\*\*. The trough dented in the above-mentioned above-mentioned other end [ wave-like ] side is hinge equipment characterized by being considered as the plate surface and the structure of \*\*\*\*(ing) while it is located in the position which makes 180 degrees mutually to the above-mentioned axial center and an above-mentioned pair of spheres carry out elastic deformation of the above-mentioned board spring with rotation of the above-mentioned hinge axis.

[Claim 4] Hinge equipment characterized by using the above-mentioned sphere as a steel ball in one of hinge equipment according to claim 1 to 3.

[Claim 5] Hinge equipment characterized by making the above-mentioned cover into square tubed or the shape of 6 rectangular pipes in one of hinge equipment according to claim 1 to 3.

[Claim 6] Hinge equipment characterized by making the above-mentioned board spring into the laminated constitution of two or more sheets in one of hinge equipment according to claim 1 to 3.

[Claim 7] Foldaway apparatus characterized by incorporating one of hinge equipment according to claim 1 to 6.

## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the hinge equipment used in order to support to revolve possible [ opening and closing of the main part cover (flip cover) folded up to the main part of apparatus ] in foldaway apparatus, such as for example, a foldaway cellular-phone machine and a notebook type personal computer.

[0002]

[Description of the Prior Art] For example, in a foldaway cellular-phone machine, by making a flip cover into a closed state at the time of un-using it, protect a switch etc. and carrying is made easy. It is what operates the switch which made the flip cover \*\*\*\*\* at the time of use, and was exposed, and the various proposals of the hinge equipment equipped with the function to hold a flip cover to a closed state and \*\*\*\*\* for this reason are made conventionally. Drawing 8 A shows the hinge equipment attachment portion of such a foldaway cellular-phone machine, and drawing 8 B decomposes into each part, and shows the hinge equipment attached. First, the composition of this hinge equipment 11 is explained.

[0003] Hinge equipment 11 is constituted by housing 12, the hinge axis 13, the cam 14, the coiled spring 15, and the cover 16. As shown in the figure in while, a flank is made into the curved surface of a semi-circle, the flank of another side is made into a flat side, and housing 12 is having tubed made in this example. A guide rail 12a is formed in a flat side, and a pair of stop holes 12b are formed in the both-sides surface part. Furthermore, it hides by a diagram, and the opening is formed in the blockaded end side although it is not visible. A major diameter 13b is formed in the end side of the axial part 13a, and the hinge axis 13 inserted in housing 12 has the mountain-shaped projected part 13c in the axial part [ of the major diameter 13b ] 13a, and opposite side. In addition, a pair of notch planes [ 13d of ] are formed in the other end side of the axial part 13a in parallel.

[0004] A cam 14 gears with the mountain-shaped projected part 13c of the hinge axis 13, and has at the end the valley-shaped portion 14a which carries out sliding contact, and the mountain-shaped part 14b. Moreover, Projection 14c protrudes so that it may engage with the guide rail 12a of housing 12, and rotation may be prevented and a cam 14 can slide along with a guide rail 12a, and 14d of spring fixed projections are further formed in the end face by the side of a cover 16. The projection 16b which the cover 16 is equipped with a pair of stop projections 16a stopped by the stop hole 12b of housing 12, and is inserted in the guide rail 12a of housing 12 is formed.

[0005] The assembly of hinge equipment 11 makes the axial part 13a of the hinge axis 13 insert in the opening currently formed in the end side of housing 12. Make the axial part 13a project from an opening, and the hinge axis 13 is accommodated in housing 12. Next, as a valley-shaped portion 14a and the mountain-shaped projected part 13c of the hinge axis 13

are united, a cam 14 is inserted into housing 12. Furthermore, after fixing one end of a coiled spring 15 to 14d of spring fixed projections, the other end of a coiled spring 15 is fixed to the projection (not shown) of a cover 16. It is carried out by making the stop hole 12b of housing 12 stop the stop projection 16a of a cover 16, and this will be in the state where the cam 14 was forced on the hinge axis 13 by the thrust of the coiled spring 15.

[0006] Thus, the storage space of the main part 17 of telephone is equipped with the assembled hinge equipment 11. Hinge equipment 11 is attached to two main parts 17 of telephone, and the axial part 13a in which 13d of notch planes of the hinge axis 13 were formed as shown in drawing 8 A is projected outside. The fitting mouth 18b with which the axial part 13a of the hinge axis 13 fits in is formed in a pair of neck assemblies 18a of the flip cover 18, respectively, and by making the hinge axis 13 fit into these fitting mouth 18b, the flip cover 18 is supported to revolve possible [ opening and closing ] by the main part 17 of telephone, and is attached to it.

[0007] When opening the flip cover 18, after a cam's 14 carrying out slide retreat and resulting on the top of the mountain-shaped part 14b along the slope of the valley-shaped portion 14a which is in contact with the mountain-shaped projected part 13c of the hinge axis 13, slide advance is carried out along the slope by the side of other. And if it becomes the position where a mountain-shaped projected part 13c and a mountain-shaped valley-shaped portion 14a gear by the thrust by a coiled spring 15, rotation of the flip cover 18 will stop and the predetermined degree of open angle will be held. On the other hand, when closing the flip cover 18, after a cam's 14 carrying out slide retreat and resulting on the top of the mountain-shaped part 14b along the slope of the valley-shaped portion 14a which is in contact with the mountain-shaped projected part 13c of the hinge axis 13, slide advance is carried out along the slope by the side of other. At this time, to the flip cover 18, the power of the closed direction will continue by the thrust of a coiled spring 15, and it will act.

[0008]

[Problem to be solved by the invention] By the way, it sets to the hinge equipment 11 made into the above structures. Since the field which the mountain-shaped projected part 13c of the hinge axis 13, the valley-shaped portion 14a of a cam 14, and the mountain-shaped part 14b make was what carries out sliding contact, it was comparatively large, and the problem was in the smooth nature of rotation of the hinge axis 13 at the point. [ of friction at the time of rotation of the hinge axis 13 (sliding friction) ] Moreover, although the hinge axis 13 and the cam 14 were generally made into the product made of resin, friction had become a large part and the thing which is easily worn out and has a problem also in respect of a life (endurance).

[0009] It is in the purpose of this invention offering hinge equipment excellent in the operativity and endurance which rotation of a hinge axis is easy and smooth, and can realize reinforcement further in view of these problems.

[0010]

[Means for solving problem] The cover by which the opening was formed in nothing and an end side in the shape of an rectangular pipe according to invention of Claim 1, The hinge axis which it had the crevice which left the periphery part to the axial part and opposite side of an axial part, the major diameter following the axial part, and its major diameter, and was formed in them, and the axial part was projected from the above-mentioned opening, and was accommodated in the cover, [REDACTED] which it has waveform form in the direction of a circumference, and the [REDACTED] which protruded on the perimeter was stopped by the above-mentioned periphery part, and was accommodated in the above-mentioned crevice, Are put between the board spring and the other end side of a cover, and shall \*\*\*\* with a board spring and it shall consist of [REDACTED] which are located in the position of the circumference of the axial center of a hinge axis which makes [REDACTED] mutually and by which rotation of the circumference of the above-mentioned axial center was regulated with the inner wall of the cover. The trough dented in the above-mentioned wave-like above-mentioned opening direction is made into the plate surface and the structure of \*\*\*\*(ing), while it is located in the position which makes 180 degrees mutually to the above-mentioned axial center and a [REDACTED]



[0011] The cover by which the opening was formed in nothing and an end side in tubed according to invention of Claim 2, The hinge axis which it had the crevice which left the periphery part to the axial part and opposite side of an axial part, the major diameter following the axial part, and its major diameter, and was formed in them, and the axial part was projected from the above-mentioned opening, and was accommodated in the cover, The circular board spring which it has waveform form in the direction of a circumference, and the projection which protruded on the perimeter was stopped by the above-mentioned periphery part, and was accommodated in the above-mentioned crevice, Accommodation positioning is carried out at the receiving part formed in \*\*\*\* by which accommodation fixation was carried out at the other end side of a cover, and its \*\*\*\*. It shall be fixed to the position of the circumference of the axial center of a hinge axis which makes 180 degrees mutually, and shall consist of a board spring and a pair of spheres which \*\*\*\*. The trough dented in the above-mentioned wave-like above-mentioned opening direction is made into the plate surface and the structure of \*\*\*\*(ing), while it is located in the position which makes 180 degrees mutually to the above-mentioned axial center and a pair of spheres carry out elastic deformation of the board spring with rotation of a hinge axis.



[0012] The cover by which the opening was formed in nothing and an end side in tubed according to invention of Claim 3, The hinge axis which it had the axial part, the major diameter following the axial part, the axial part of the major diameter, and the receiving part formed in the opposite side, and the axial part was projected from the above-mentioned

opening, and was accommodated in the cover, The board spring which accommodation fixation is carried out at the other end side of a cover, and has waveform form in the hand of cut of a hinge axis, Accommodation positioning shall be carried out at the above-mentioned receiving part, and it shall be fixed to the position of the circumference of the axial center of a hinge axis which makes 180 degrees mutually, and shall consist of a board spring and a pair of spheres which \*\*\*\*. The trough dented in the above-mentioned above-mentioned other end [ wave-like ] side is made into the plate surface and the structure of \*\*\*\*(ing), while it is located in the position which makes 180 degrees mutually to the above-mentioned axial center and a pair of spheres carry out elastic deformation of the board spring with rotation of a hinge axis.

[0013] Let a sphere be a steel ball in one invention of the Claims 1-3 in invention of Claim 4. In invention of Claim 5, a cover is made into square tubed or the shape of 6 rectangular pipes in one invention of the Claims 1-3. Let a board spring be the laminated constitution of two or more sheets in one invention of the Claims 1-3 in invention of Claim 6. Foldaway apparatus should be incorporated in invention of Claim 7 in one of hinge equipment according to claim 1 to 6.

[0014]

[Mode for carrying out the invention] With reference to Drawings, a work example explains the form of implementation of this invention. drawing 1 shows one work example of this invention -- this example -- hinge equipment 21 --  - it is constituted by 25. A cover 22 has square tubed [ with which each corner part was rounded circularly ] made, and the  is formed in the blockaded end side.

[0015] It shall have the  which makes the shape of a cross-sectional abbreviation rectangle, and the flange-like major diameter 28 following the axial part 27, and the axial part 27 is projected from the opening 26 of a cover 22, and a major diameter 28 escapes from the hinge axis 23 by the end face of a cover 22, it is stopped, is carried out, and is accommodated in the cover 22. It leaves the periphery part 29 to the axial part 27 and opposite side of a major diameter 28 of the hinge axis 23, 

Drawing 2 A shows the form of the board spring 24, it is supposed that the board spring 24 is circular, it has a hole 32 in the center, and a pair of projections 33 protrude on the perimeter.

[0016] This board spring 24 shall have waveform form in the direction of a circumference, and as this example showed to the figure, Trough 24a and Yamabe 24b are formed in a 90-degree pitch. That is, Trough 24a was formed in the position which makes 180 degrees mutually to a center, and Yamabe 24b was formed in it and the rectangular direction. As a pair of the projections 33 showed drawing 1 B, the board spring 24 which has the above form shall be inserted in \*\*\*\*\* 34 formed in the periphery part 29 of the hinge axis 23, respectively, shall be

stopped by the hinge axis 23, and shall rotate with the hinge axis 23. In addition, the board spring 24 is attached in the direction in which the trough 24a is dented in the opening 26 direction of a cover 22.

[0017] a pair of spheres -- as it is located in the position of the circumference of the axial center of the hinge axis 23 which makes 180 degrees mutually and was shown in drawing 1 A,  
 Let these sphere 25 be the size which touches mostly mutually while they touch the inner wall of a cover 22. setting up the size and arrangement position of sphere 25 in this way -- a sphere -- rotation of the circumference of the axial center of the hinge axis 23 shall be regulated with the inner wall of a cover 22, namely, the position in a cover 22 shall be specified, and

[0018] the inside of the sphere cover 22 after inclusion of 25 inserts the  
 into a cover 22 -- a sphere -- 25 is inserted and it is carried out by bending, escaping from, stopping, carrying out and pressing a pair of pieces 35 of a stop prepared in the other end side of a cover 22. Sphere 25 will be in the state where it was inserted with the piece 35 of a stop and the board spring 24 which constitute the other end side of a cover 22, and \*\*\*\* (ed) with the board spring 24. the board spring 24 -- a sphere -- the hinge axis 23 is energized in the direction which projects from an opening 26, and makes the hinge axis

and the board spring 24 carries out elastic deformation in this way  
 [0019] that is, -- this example -- a pair of spheres -- if the hinge axis 23 is rotated from the stable state where 25 is located in the trough 24a of the board spring 24 the  
 carrying out elastic deformation -- the elastic deformation -- a sphere -- the hinge axis 23 is made to have generated torque until 25 is again located in Trough 24a on the other hand -- a sphere -- carrying out elastic deformation of the board spring 24 with rotation of the hinge axis 23, 25 rotates in the position (rotation), that is, has the plate surface of the board spring 24, and the structure of \*\*\*\*(ing).

[0020] According to the hinge equipment 21 considered as the above composition, it has waveform form. using sphere 25 as a member which engages with the board spring 24 which has Trough 24a and Yamabe 24b -- a sphere -- [ 25 ] in order that 25 may roll with the board spring 24 and may contact with rotation of the hinge axis 23 Friction at the time of rotation of the hinge axis 23 can be made small, and, therefore, hinge equipment that rotation of a hinge axis is easy and smooth can be obtained. moreover, a part with small friction and wear -- \*\*\*\* -- butter fish -- \*\* -- reinforcement can be attained at the point.

[0021] As a component of sphere 25, various hard material, such as metal, ceramics, and glass, can be used. It is desirable to use a steel ball from the field of cost and quality. A cover 22 is made into metal, for example, is formed of press processing. On the other hand, let the

hinge axis 23 be a product made of resin. In addition, the hinge axis 23 can also be formed by metal material. Form of a cover 22 can also be made into the shape of 6 rectangular pipes not only in the above form, for example. drawing 3 shows other work examples of this invention -- this example -- hinge equipment 41 -- a sphere -- \*\*\*\* 42 is provided as an object for position fixation of 25. In addition, the same mark is given to drawing 1 and a corresponding portion. [0022] \*\*\*\* 42 is made into the form which meets the inner circumference form of a cover 22 mostly as shown in the figure, and it is accommodated in the other end 35, i.e., piece of stop, side of a cover 22, and a pair of receiving parts 43 are formed in the board spring 24 and the field which counters. these receiving parts 43 have a rectangle-like crevice made -- a pair of spheres -- 25 is accommodated in these receiving parts 43, is positioned, and it is fixed to the position of the circumference of the axial center of the hinge axis 23 which makes 180 degrees mutually, and it is made into the board spring 24 and the structure of \*\*\*\*(ing). comparing with the hinge equipment 21 shown in drawing 1 according to this structure -- a sphere -- the size of 25 can be made small and the setting flexibility of that size also serves as size. moreover, hinge equipment 21 -- like -- a sphere -- since it is not what regulates corotation with the hinge axis 23 of 25 with the inner wall of a cover 22, the form flexibility of a cover 22 also serves as size.

[0023] In addition, by making a cover 22 into the shape of 4 rectangular pipes like this example, and making \*\*\*\* 42 into the form in alignment with that inner circumference form, only by inserting \*\*\*\* 42 in a cover 22, rotation of the circumference of the axial center of that hinge axis 23 can be prevented, that is, positioning fixation of \*\*\*\* 42 can be carried out to a cover 22. Although a board spring shall be attached to a hinge axis and the board spring shall rotate with rotation of a hinge axis in the example mentioned above, [REDACTED] and it can also be considered [REDACTED]

[0024] Drawing 4 shows the hinge equipment 51 made into such structure. In this example, the axial part 27 of the major diameter 28 of the hinge axis 23, the receiving part 43 of \*\*\*\* 42 mentioned above in the opposite side, and a pair of same receiving parts 52 are formed. these receiving parts 52 -- a sphere -- accommodation positioning should be carried out in 25 -- a pair of spheres -- 25 is being fixed to the position of the circumference of the axial center of the hinge axis 23 which makes 180 degrees mutually. On the other hand, accommodation fixation of the board spring 53 is carried out at the other end 35, i.e., piece of stop, side of a cover 22. [REDACTED] which is made into form as shown in drawing 2 B, namely, agrees with the inner circumference form of a cover 22.

[0025] A hole 54 shall be formed in the center of the board spring 53, and it shall have waveform form in the direction of a circumference like the board spring 24 shown in drawing 2



A. 53a shows a trough among a figure, 53b shows Yamabe, Trough 53a is formed in the position which makes 180 degrees mutually to a center, and Yamabe 53b is formed in it and the rectangular direction. the assembly of this hinge equipment 51 inserts the hinge axis 23 in a cover 22 -- that receiving part 52 -- a sphere -- after dedicating 25 and inserting the board spring 53, it is carried out by bending, escaping from, stopping, carrying out and pressing the piece 35 of a stop. thereby -- a sphere -- 25 \*\*\*\* with the board spring 53 and the board spring 53 will be in the state where elastic deformation was carried out. In addition, the board spring 53 is inserted in the direction in which the trough 53a is dented in the piece of stop 35 directions.

[0026] following on

states to the circumference of that axial center with the hinge axis 23, and it rolls that board spring 53 top,

Therefore, the board spring 53 which has waveform form makes the hinge axis 23 generate torque by the elastic deformation. In addition, that position is fixed, without the board spring 53 moving to the circumference of the axial center of the hinge axis 23 by making a cover 22 into the shape of 4 rectangular pipes like this example, and making the board spring 53 into the form corresponding to that inner circumference form.

[0027]

Drawing 5 A and B can perform torque adjustment by showing the example which made the board spring 53 two sheets to the hinge equipment 51 shown in the example and drawing 4 which made the board spring 24 two sheets to the hinge equipment 21 shown in drawing 1 , and adopting such composition, respectively. In addition, torque can be adjusted also by changing the quality of the material and board thickness of a board spring.

[0028] On the other hand, the torque curve at the time of hinge axis rotation (mode of operation) can be set as a desired torque curve by changing the waveform form of a board spring. Drawing 6 A and B show other waveform-shaped examples to the board springs 24 and 53 shown in drawing 2 A and B, respectively. These board spring 24' and 53' are what has Troughs 24a and 53a in the position which makes 180 degrees mutually to the center, and the depth compares them with the board springs 24 and 53, and they are deep. The torque curve of the board spring which drawing 7 showed by comparison an example of the torque curve of a board spring which has waveform form as shown in the board spring which has waveform form as shown in these drawing 2 , and drawing 6 , and showed drawing 2 drawing 7 A, and drawing 7 B show the torque curve of the board spring shown in drawing 6 . Various torque curves can be set up by selecting waveform form than a figure. In addition, drawing 7 A is a low torque type, and drawing 7 B has become a high torque type.

[0029]

[Effect of the Invention] The board spring which has waveform form in the hand of cut of a hinge axis according to this invention as explained above, Since it has the plate surface and the structure of \*\*\*\*(ing) while it has the board spring and the sphere which \*\*\*\*,

Moreover, the wear damage to a small part and a contact portion also has little friction, it is excellent in endurance with the point, and reinforcement can be attained.

[0030] In addition, since it is what uses like the conventional hinge equipment 11 shown in drawing 8 , and a miniaturization can be attained at the point.

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[Translation done.]